

Comparison between fibrin glue versus mechanical mesh fixation in laparoscopic inguinal hernia repair: A prospective study

Original
Article

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ABSTRACT

Background: Inguinal hernia repair is one of the most common surgical procedures in general surgery. The rate of occurrence of inguinal hernia is about 27–43% in men and 3–6% in women. An open or laparoscopic approach can be used. Mesh repair is recommended either by an open procedure or laparoscopic technique. There is no consensus on the best method to do inguinal hernia repair, either open or laparoscopic.

Objective: To compare glue versus mechanical mesh fixation in laparoscopic inguinal hernia repair as regards operative time, blood loss, hospital stay, and short-term complications.

Patients and Methods: This is a prospective comparative cohort study between fibrin glue versus mechanical mesh fixation in laparoscopic inguinal hernia repair. This study was conducted at the General Surgery Department, Ain Shams University Hospitals. Approval of the Ethical Committee and written informed consent from all participants was obtained.

Results: There are many postoperative complications, such as seroma, numbness, wound infection, and early recurrence. Early recurrence after open hernia repair can occur in up to 63% of patients and affects the quality of life in 5–10%, so there is an increase in usage of the laparoscopic method to decrease the postoperative complication. Mesh fixation in laparoscopic inguinal hernia repair remains highly debated, being largely influenced by individual surgeon preferences. The use of tackers or staples increases postoperative pain and is associated with chronic and immediate postoperative pain and may risk neurovascular injury. Nonpenetrative methods of mesh fixation using tissue glue have been used for laparoscopic inguinal hernia repair, and have been associated with improved postoperative complications and chronic pain.

Conclusion: Fibrin glue is a safe and practical choice for mesh fixation in laparoscopic inguinal hernia repair. In terms of shorter fixation times and lower rates of seroma/hematomas, it has various benefits. Early recurrence and numbness, however, were shown to be comparable in both groups.

Key Words: Fibrin glue, totally extraperitoneal procedure, transabdominal preperitoneal procedure.

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INTRODUCTION

Inguinal hernia repair is one of the most common surgical procedures done in general surgery^[1]. Repair of an inguinal hernia via surgery is the only treatment for inguinal hernias and can prevent very important complications that can be life-threatening to the patient, like incarceration and strangulation. Surgeons recommend repairing all hernias to avoid complications. An open or laparoscopic approach can be used^[2].

Conventional repair with tissue approximation was associated with a high recurrence rate of 60% until the introduction of a polypropylene-based prosthesis (mesh) to close the hernia defect and to reinforce the abdominal wall without tension. With the implantation of prosthesis, the recurrence rate in hernia repair was downsized^[3].

An open or laparoscopic approach can be used. Mesh repair is recommended either by an open procedure or laparoscopic technique. There is no consensus on the best method to do inguinal hernia repair, either open or laparoscopic^[4].

Transabdominal preperitoneal operation (TAPP): the TAPP operation was first reported by Kurmann and Beldi^[5].

Totally extraperitoneal hernia (TEP): first described completely totally extraperitoneal repair in 1993.

The optimal method for fixation of the prosthetic mesh is controversial. There are many options like mechanical fixation, such as tackers, nonmechanical methods like adhesive material (fibrin glue)^[6].

A significant degree of postoperative pain is still reported despite the fact that the use of polypropylene mesh permits the creation of a tension-free method.

Aim

This study aims to compare glue versus mechanical mesh fixation in laparoscopic inguinal hernia repair as regards operative time, hospital stay, and short-term complications.

PATIENTS AND METHODS:

(1) Type of study: this is a prospective comparative cohort study between fibrin glue versus mechanical mesh fixation in laparoscopic inguinal hernia repair.

(2) Study setting: this study was conducted at the General Surgery Department, Ain Shams University Hospitals. Approval of the Ethical Committee and written informed consent from all participants was obtained.

(3) Study period: between September 2022 and February 2023 with postoperative follow-up for maximum 6 months.

(4) Study population.

Inclusion criteria

- (1) Male and female patients.
- (2) 20–50 years of age.
- (3) Fit for surgery.
- (4) Willing to attend follow-up visits.
- (5) Noncomplicated unilateral inguinal hernia.

Exclusion criteria

- (1) High-risk patients unfit for surgery.
- (2) Old age (over 50 years old).
- (3) Young age (below 20 years old).
- (4) The patient refusal to enroll in the study.
- (5) Huge inguinoscrotal hernia (sac size >5 cm).
- (6) Recurrent hernia on the same side.

Methods

Sample size

Fifty patients.

Sampling method

Fifty patients with the unilateral nonrecurrent inguinal hernia were classified into two groups according to the type of surgery: group A underwent surgery by using mechanical

fixation in mesh fixation, and group B underwent surgery by fibrin glue in mesh fixation. They were classified by single-blinded randomized controlled trial.

Randomization and blinding

Randomization was performed the day before surgery. Patients were randomized using a computer-generated randomization code and assigned either to experimental group A mechanical fixation. Group B for fibrin glue. The two groups were balanced at a ratio of 1 : 1. The study was carried out under single-blind conditions.

All patients included in our study were subjected to:

- (1) Clinical assessment including history and clinical examination of all hernial orifices.
- (2) Investigations: routine laboratory investigations.
- (3) Surgical procedures: laparoscopic inguinal hernia repair (TAPP) with mesh fixation either by fibrin glue versus mechanical mesh fixation.
- (4) Ethical considerations: consent from patient and hospital administration. Keep patient confidentiality.
- (5) Outcome measures:
 - (a) Operative time (min).
 - (b) Hematoma/seroma.
 - (c) Wound infection.
 - (d) Postoperative groin pain.

Surgical technique

Operative techniques

The operative technique of laparoscopic TAPP hernioplasty: after administration of general anesthetic, routine sterilization of the entire abdominal wall, from the nipple line to the midhighs, penis and scrotum was performed.

Laparoscopic technique for transabdominal preperitoneal prosthesis

Patient positioning: the patient is placed in a supine position with both arms tucked in at the sides. The skin is prepared and draped to expose the whole lower abdomen, the genital area, and the upper thighs since it may be necessary to handle the scrotum and hernial sac. After the laparoscope is implanted, the patient is placed in a deep Trendelenburg posture to allow the viscera to move away from the inguinal regions.

The surgeon is positioned on the contralateral side of the hernia, with the assistant surgeon and nurse on the side of the hernial defect.

Step (1): placement of abdominal trocars: in order to establish pneumoperitoneum, a small infraumbilical incision is necessary. We generally preferred an open approach. Subsequently, CO₂ is injected into the abdomen at a pressure of 12–15 mmHg. The two inguinal areas are inspected when the angled laparoscope is inserted. Two 5 mm openings are placed, one at the lateral border of each rectus abdominis at the level of the umbilicus, to allow for the installation of the camera and the equipment (Fig. 1).

Step 2: identification of anatomic landmarks: the four significant anatomic markers – the inferior epigastric vessels (lateral umbilical ligament), the destroyed umbilical artery (medial umbilical ligament), the spermatic vessels, and the external iliac vessels – were located on either side. Using the curved scissors or the hook cautery, a transverse incision was made along the peritoneum, beginning 2 cm above the upper border of the internal inguinal ring, extending medially over the pubic tubercle, and laterally 5 cm beyond the internal inguinal ring, with the goal of creating a peritoneal flap. Much care was taken to avoid the inferior epigastric veins.

Step (3): creation of a peritoneal flap: to construct a lower peritoneal flap, the peritoneal sac was dissected using blunt and sharp tools, and the incised peritoneum and associated preperitoneal fat were grabbed. The dissection stayed near the wall of the abdomen (Fig. 2).

Step (4): dissection of the hernial sac: the hernial sac, if present, was removed from Hesselbach's triangle or the spermatic cord and surrounding muscle using inward traction, countertraction, blunt dissection, and progressive inversion of the sac until the important deep anatomic structures and the musculofascial boundary of the internal inguinal ring were identified. The transversalis fascia or spermatic cord was often progressively pushed away from the hernial sac. The sac is grasped at its peak by inversion. Once the peritoneal flap was formed, the previously specified essential anatomic landmarks were reidentified and exposed to protect neurovascular systems and identify the tissues required for reliable mesh attachment.

The pubic tubercle frequently feels rather than appears. Along the pectineal prominence of the superior pubic ramus, Cooper's ligament was first felt and then seen as dissection moved laterally, sweeping off fatty tissue to show the shining white structure. The many small veins that often flow along the surface of the ligament, as well as the occasional aberrant obturator artery, were carefully avoided.

The iliopubic tract began at the inferior margin of the internal inguinal ring, where the spermatic cord was situated. After that, the tract was tracked medially and laterally. Very little dissection was done inferior to the iliopubic tract so as not to damage the femoral nerve, the genital femoral nerve, or the lateral cutaneous nerve of the thigh.

Step (5): placement of the mesh: a standard flat polypropylene mesh sheet was wrapped into a tubular shape and inserted into the abdomen via the 10/12 mm umbilical trocar, in group A involved positioning of about three to four absorbable tacks at the level of Cooper's ligament and the pubic tubercle. In the fibrin glue group, tissue glue) was used for mesh fixation. This glue, a mixture of fibrinogen and thrombin, was applied using a laparoscopic applicator or Duplotip. The peritoneum was then re-approximated using fibrin glue in group B and tackers in group A, covering the mesh and containing the superfluous inverted hernial sac (Fig. 3).

Step (6): closure of the peritoneum: then the peritoneal flap, including the redundant inverted hernial sac, was placed over the mesh, and the peritoneum was re-approximated with the tackers (Fig. 4).

Step (7): closure of the fascia and skin: to make sure there are no significant openings that might expose the mesh and cause adhesions to develop, the peritoneal repair was examined. The pneumoperitoneum was then freed after the trocars were withdrawn under direct eyesight. To avoid incisional hernias, the fascia at the 10/12 mm port sites is sealed using 2-0 proline sutures. With 4-0 absorbable subcuticular sutures, the skin is sealed.



Fig. 1: Trocar placement in TAPP technique. TAPP, transabdominal preperitoneal prosthesis.

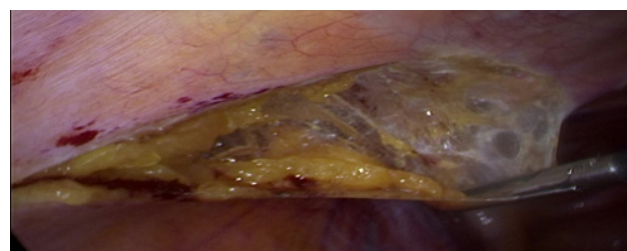


Fig. 2: Dissection of the peritoneal flap.

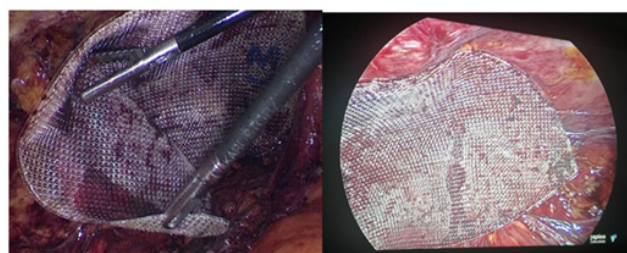


Fig. 3: Placement of the mesh into the anatomical position.

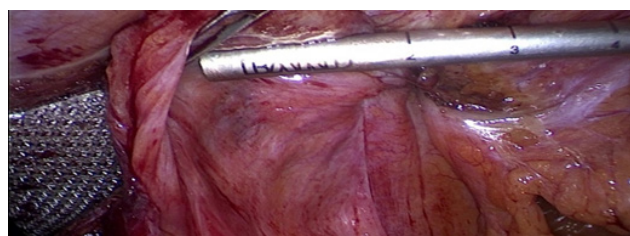


Fig. 4: Closure of the peritoneal flap.

Statistical analysis

Statistical analysis was done using IBM SPSS statistics for windows, Version 23.0. Armonk, NY: IBM Corp was used to enter edit, and review the data. The ranges, SDs, and mean of the quantitative data were displayed. Quantitative variables were also shown as percentages and numbers. When the predicted count in any cell was found to be less than 5, the χ^2 test and/or Fisher exact test were used to compare the qualitative data between groups. A parametric distribution was employed to compare two quantitative parameters using the independent t test. The allowable margin of error was set at 5%, while the confidence interval was set at 95%. Thus, the following *P value* was deemed significant: *P value* greater than 0.05 indicates nonsignificant). *P value* less than 0.05 indicates significance. Highly significant is a *P value* less than 0.01.

RESULTS:

Preoperative findings

Patient characteristics

Our study included 50 patients arranged in two groups group A, about 25 patients with mechanical mesh fixation and group B about 25 patients with fibrin glue in mesh fixation with a mean age of 38 and SD of 8.416 (Fig. 5).

Regarding comorbidities between the two groups

Among 25 patients in group A, about seven patients have diabetes mellitus (DM), and about five patients from 25 patients in group two have DM with percent 51.7 and 48.1%, respectively.

Regarding hypertension (HTN) three patients in group A and five patients in group B were diagnosed with HTN at percent 37.5 and 62.5%, respectively.

Regarding HTN and DM one patient in group A and two patients in group B were diagnosed with HTN and DM at percent 33.3 and 66.7%, respectively.

Fourteen patients in group A and 13 patients in group B have no comorbidities with percent 51.9 and 48.1%, respectively (Table 1).

Regarding operative time between the two groups, group A mean time is 90.8 min with a SD of 22.7 and group B mean time is 88.6 min with SD of 22. The mean operating time was slightly greater in the tacker group when compared to the fibrin group, but the result was not statistically significant ($P=0.7294$) (Table 2).

The table shows the operative time between the two groups.

Regarding seroma/hematoma between the two groups, about three patients in group A have seroma/hematoma, and about one patients in group B have seroma/hematoma with χ^2 1.065 and $P=0.3020$ (Table 3).

Table 3 shows the cross-tabulation of seroma/hematoma between the two groups.

Regarding wound infection between the two groups, about one patients in group A have wound infection, and about 0 patients in group B have wound infection with χ^2 0.246 and $P=0.6197$ (Table 4).

Regarding postoperative pain between the two groups, about 24 patients in group A have postoperative groin pain and about 23 patients in group B.

All patients managed the same by two injection of the same (NSAID) on the same day, then discharged on the same oral analgesics.

There is a statistically difference between the two groups, as group B shows improvement in the postoperative groin pain regarding the number and the duration of the pain postoperative (Table 5).

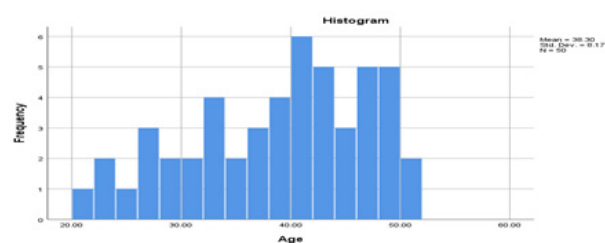


Fig. 5: Age.

Table 1: Comorbidities between the two groups

Crosstab		Mechanical fixation	Fibrin glue	Total
Comorbidities				
No comorbidities				
Count	14	13	27	
% within comorbidities	51.9	48.1	100.0	
DM				
Count	7	5	12	
% within comorbidities	58.3	41.7	100.0	
HTN				
Count	3	5	8	
% within comorbidities	37.5	62.5	100.0	
DM and HTN				
Count	1	2	3	
% within comorbidities	33.3	66.7	100.0	
Total				
Count	25	25	50	
% within comorbidities	50.0	50.0	100.0	

Table 2: The operative time between the two groups

Group statistics								
	Mechanical fixation	fibrin glue	N	Mean	SD	P value	t test value	SE mean
Operative time	Mechanical fixation		25	90.8000	22.76447	0.7294	0.3480	4.540
	Fibrin glue		25	88.6000	22.08084			

Table 3: Seroma/hemtoma×mechanical fixation fibrin glue cross-tabulation

		Mechanical fixation	Fibrin glue	Total	
Seroma/hemtoma	Yes	Count	3	1	4
		% within seroma/hemtoma	12%	4%	
Difference		95% CI	χ^2	DF	Significance level
	8 %	-9.4062% to 26.2548%	1.065	1	P=0.3020

Table 4: Wound infection×mechanical fixation fibrin glue cross-tabulation

Crosstab		Mechanical fixation	Fibrin glue	Total	
Wound infection	Yes	Count	1	0	1
		% within wound infection	4%	0%	100.0%
Difference		95% CI	χ^2	DF	Significance level
	1%	-12.3525% to 14.9950%	0.246	1	P=0.6197

Table 5: The cross-tabulation of postoperative groin pain between the two groups

	Mechanical mesh (N=25)		P
	Postoperative pain	Fibrin glue (N=25)	
Yes	24	23	+7
No	1 duration (weeks)	2	+9
1 week	4 (16.6)	12 (52.1)	0.01
2 weeks	7 (29.1)	8 (34.7)	0.6
3 weeks	11 (45.8)	3 (13.04)	0.01
4 weeks	2 (8.3)	0	0.01

DISCUSSION

Inguinal hernia repair is one of the most common surgical procedures in general surgery. There are many postoperative complications, such as seroma, numbness, wound infection, and postoperative pain. So there is an increase in usage of the laparoscopic method to decrease the postoperative complication as the laparoscopic method showed more benefits than the open method.

This research compares the use of fibrin glue against mechanical mesh fixation in laparoscopic inguinal hernia repair. It is prospective and single-blinded. Fifty patients total were divided into two groups for our study: group A consisted of ~25 patients who had mechanical mesh fixation, and group B consisted of about 25 patients who had fibrin glue mesh fixation.

In our investigation, regarding operative time between the two groups, group A mean time is 90.8 min with a SD of 22.7 and group B mean time is 88.6 min with a SD of 22. The mean operating time was slightly greater in the tacker group than in the fibrin group but the result was not statistically significant ($P=0.7294$). In meta-analysis by Shi *et al.*^[7] comparing mechanical mesh and fibrin glue fixation of mesh in TAPP, no statistical difference in the operating time was found, and in a meta-analysis by Kaul *et al.*^[8] comparing staple and fibrin glue fixation of mesh, there was no statistical difference in the operating time.

Regarding seroma/hematoma between the two groups, about three patients in group A have seroma/hematoma, and about one patients in group B have seroma/hematoma with χ^2 1.065 and $P=0.3020$ but the results were not statistically significant. Patients who developed postoperative seroma/hematoma in the present study were effectively managed conservatively. This is consistent with the studies published in the meta-analysis by Kaul *et al.*^[8].

After assessing wound infection, about one patients in group A have wound infection, and about 0 patients in group B have wound infection with χ^2 0.246 and $P=0.6197$ with no significant value.

Regarding postoperative groin pain, all patients managed the same by two injection of the same (NSAID) on the same day, then discharged on the same oral analgesics; about 24 patients in group A have postoperative groin pain and about 23 patients in group B.

Postoperative groin was significantly less in the fibrin glue group when compared to the tacker group during all follow-ups beginning from postoperative day 1. This leads to decreased hospital stays and early return to work.

Fixation of the mesh with nonmechanical techniques such as fibrin glue causes lesser pain. Fibrin glue has been initially investigated in open hernia surgery in comparison with sutures and was associated with significantly lesser postoperative pain^[9-11].

In the present study, on postoperative day 1 and at 14 days and 21 days of follow-up, the fibrin glue group had significantly lesser pain when compared to the tacker group and the same was proven in the meta-analysis by Kaul *et al.*^[8]. However, few studies did not show any statistically significant difference in the postoperative pain over a long period, although pain was less in the glue fixation group in the immediate postoperative period^[12,13].

CONCLUSION

Fibrin glue is a safe and practical choice for mesh fixation in laparoscopic inguinal hernia repair, allowing better results regarding postoperative groin pain, less analgesics, and early return to daily activities.

Regarding postoperative seroma, infection and operative time. There was no significant difference between the two techniques.

So, fibrin glue fixation should be advised over mechanical fixation for mesh fixation in laparoscopic hernia repair, considering the better outcomes and cost-effectiveness.

CONFLICT OF INTEREST

There are no conflicts of interest.

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